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(54) INJECTION MOULDING FOOTWEAR

(71) We, EZIO TOJA, of Via Montebello 4, Legano, Italy, and LUCIANO BELL, of Via le Lombardia 42, Castellanza, Italy, both Italian citizens, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a method for manufacturing a double-layered sole on a footwear upper with a mould assembly and an article of footwear with a double-layered sole made by the said method.

A number of methods for injection moulding footwear are known to obtain footwear with a double-layered sole. These methods have various disadvantages well known to those skilled in the art.

The aim of the invention is to avoid some of these drawbacks.

According to the present invention there is provided a method for manufacturing a double-layered sole on a footwear upper in a mould assembly of the type comprising a stationary frame with two injection ducts spaced from one another and a shaped bottom plunger movable inside a cavity of said frame into a first and a second position, the method including the step of arranging a last provided with an upper inside said cavity, the step of displacing said bottom plunger into a first position spaced from said upper and of injecting a first thermoplastic material forming a first sole layer into the space thereby defined between said bottom plunger and said upper through at least one injection passage provided inside said bottom plunger and communicating with a first of said injection ducts, and the step of displacing said bottom plunger into said second position and of injecting a second thermoplastic material forming a second sole layer into the space thereby defined between said bottom plunger and said first layer through a second of said injection ducts, said displacement of said bottom plunger from said first position into said second position

being effected by an extent greater than the thickness of said first layer.

Advantageously the method according to the invention is carried out with a mould assembly comprising a stationary frame having two injection ducts spaced from one another for injecting two thermoplastic materials for forming a first and a second sole layer, respectively, into a cavity defined internally of said frame and receiving a last provided with an upper, and a bottom plunger movable inside said cavity into a first and a second injection position for forming said first and said second sole layers, respectively, said bottom plunger having a shaped surface facing said upper and at least one injection passage having an inlet end aligned with a first of said injection ducts when said bottom plunger is in said first position and an outlet end arranged on said shaped surface of said bottom plunger, the second of said two injection ducts opening into said cavity in a position between said first injection duct and said upper and spaced from said upper by an extent greater than the thickness of said first sole layer.

The invention will better appear from the following detailed description of a preferred but not exclusive embodiment of the invention, made with reference to the accompanying drawing in which:

Fig. 1 is a schematic view in section of the mould assembly according to the invention in a first operative position;

Fig. 2 is a view similar to that of Figure 1 but showing the mould assembly in a second operative position; and

Fig. 3 is a top view of the movable bottom plunger of the mould assembly.

With reference to the preceding figures, at 1 a last on which a footwear upper 2 is spread, is shown. The last 1 provided with the upper 2 is placed stationary within a mould generally indicated at 3 and comprising a stationary frame 4 defining internally a through cavity 5.

This cavity has a peripheral recess 6 shaped in a way to define an interspace

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peripherally all around the lower portion of the upper 2.

In practice the frame 4 is formed in two halves which can be assembled together and moved away for the insertion of the upper 2 and the removal of the finished footwear.

The frame 4 further comprises a first injection duct 7 and a second injection duct 8, both for the conveying of a thermoplastic material to the cavity 5.

The ducts 7 and 8 both open into the cavity 5 and are arranged spaced one from the other. The duct 8 is formed in a way to open into a position near to the recess 6 of the cavity 5, while the duct 7 opens into a position further away.

A movable sole plate or bottom plunger 9 is mounted slidable inside the cavity 5.

The plunger 9 has a shaped surface 10 facing the upper 2 and has an injection passage 11 whose inlet end is aligned with the injection duct 7 when the plunger 9 is in the position shown in Fig. 1, corresponding to a first operative position of the plunger 9. The inlet end of the passage 11 is arranged in the body of the plunger 9 at a certain distance from the shaped surface 10 such that when the inlet is in alignment with the duct 7 the plunger 9 closes the exit of the duct 8, which is arranged between the duct 7 and the upper 2. The passage 11 extends throughout the plunger 9 substantially for all the length thereof. At one or more intermediate points the passage 11 branches into injection passages 12 having outlet ends which open on the shaped surface 10 into the injection cavity 5.

The obtaining of a double-layered sole made of thermoplastic rubber-like material by making use of the mould 3 takes place in the following way. The upper 2 is prearranged, first of all, within the cavity 5. The plunger 9 is moved in such a way so as to bring the passage 11 into alignment with the first injection duct 17. Between the shaped surface 10 of the plunger 9 in the first operative position and the upper 2 an interspace 13 is thus defined which may have dimensions even very reduced, due to the fact that through the passage 12 the injection materials are brought uniformly to the entire lower surface of the footwear. The injection of a first thermoplastic material therefore takes place through the injection duct 7 and the first sole layer will be obtained together with an outer peripheral border formed in the recess 6 (Fig. 1). The plunger 9 is then moved away from the first operative position into a second operative position, thus defining between the first sole layer and the plunger itself a second interspace 14 (Fig. 2) which is in communication with the second injection duct 8. As visible in the drawing (Fig. 1 and 2) the second interspace 14 is greater than the first interspace 13 that

is to say that the plunger 9 is displaced from the first position into the second position for an extent greater than the thickness of the first layer.

Then the injection of a second thermoplastic material preferably of a different colour or different properties to that forming the first layer takes place through the second injection duct 8, which is spaced from the upper 2 to to an extent greater than the thickness of the first sole layer, thus obtaining a second sole layer superimposed to the first sole layer. Then the extraction of the core of thermoplastic material from the passages 11 and 12 will be carried out and the cycle can be repeated.

As can be seen the manufacturing method is quite simple and footwear is obtained with soles without undesirable sprues or marks of the first obtained layer.

The method described herein allows to obtain a first sole layer quite thin and therefore a lighter footwear, while the necessary durability of the same is ensured by the second sole layer which is thicker.

WHAT WE CLAIM IS:—

1. A method for manufacturing a double-layered sole on a footwear upper in a mould assembly of the type comprising a stationary frame with two injection ducts spaced from one another and a shaped bottom plunger movable inside a cavity of said frame into a first and a second position, the method including the step of arranging a last provided with an upper inside said cavity, the step of displacing said bottom plunger into a first position spaced from said upper and of injecting a first thermoplastic material forming a first sole layer into the space thereby defined between said bottom plunger and said upper through at least one injection passage provided inside said bottom plunger and communicating with a first of said injection ducts, and the step of displacing said bottom plunger into said second position and of injecting a second thermoplastic material forming a second sole layer into the space thereby defined between said bottom plunger and said first layer through a second of said injection ducts, said displacement of said bottom plunger from said first position into said second position being effected by an extent greater than the thickness of said first layer.

2. A mould assembly for manufacturing a double-layered sole on a footwear upper according to the method of claim 1, comprising a stationary frame having two injection ducts spaced from one another for injecting two thermoplastic materials for forming a first and a second sole layer, respectively, into a cavity defined internally of said frame and receiving a last provided with an

- upper, and a bottom plunger movable inside said cavity into a first and a second injection position for forming said first and said second sole layers, respectively, said bottom plunger having a shaped surface facing said upper and at least one injection passage having an inlet end aligned with a first of said injection ducts when said bottom plunger is in said first position and an outlet end arranged on said shaped surface of said bottom plunger, the second of said two injection ducts opening into said cavity in a position between said first injection duct and said upper and spaced from said upper by an extent greater than the thickness of said first sole layer.
3. A mould assembly as claimed in claim 2, wherein said stationary frame has a peripheral recess extending substantially all around said cavity and communicating with the injection space defined between said upper and said movable bottom plunger when said plunger is in said first position, said peripheral recess further surrounding a lower peripheral portion of said upper inserted in said cavity and the portion of said cavity lying below said injection space and above said second injection duct.
4. A method for manufacturing a double-layered sole on a footwear upper substantially as herein described with reference to the accompanying drawing.
5. A mould assembly for manufacturing a double-layered sole on a footwear upper substantially as herein described and illustrated in the accompanying drawing.
6. An article of footwear with a double-layered sole when obtained by the method as claimed in claim 1 or in the mould assembly as claimed in either of claims 2 and 3.
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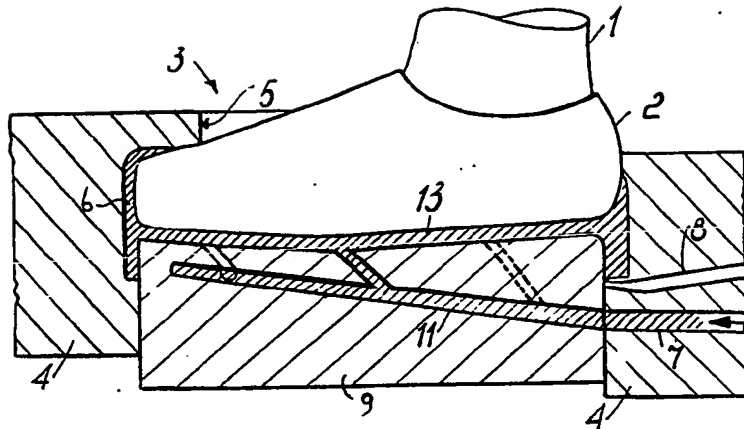


FIG. 1

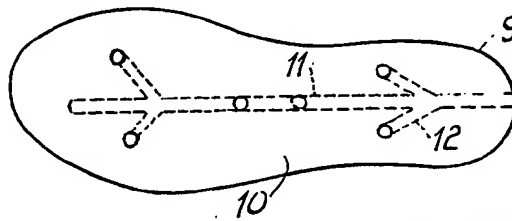


FIG. 3

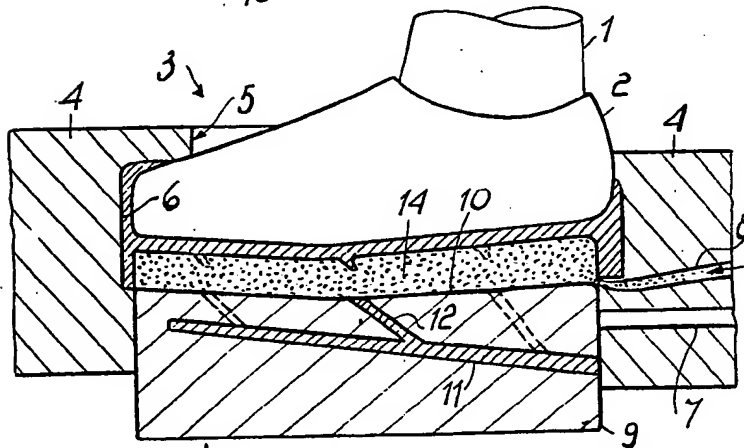


FIG. 2